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AGRICULTURAL INNOVATION IN LATIN AMERICA

Understanding the Private Sector's Role

Carlos Pomareda and Frank Hartwich



For many years, governments and donors have promoted the generation of knowledge and technological innovations that improve farming and plant genetic resources in developing countries. Because of the “public good” nature of agricultural research for developing countries, it was assumed that the private sector would not invest sufficiently in producing knowledge and technologies that contribute to rural development and poverty alleviation there. So public agencies and aid organizations have initiated and subsidized agricultural research and innovation to supplement the knowledge and technology produced by private entities. Yet many of these publicly generated improvements have not been useful to farmers, processors, and agribusiness and hence have not been adopted on a wide scale. Others have not been transferred to those who would have contentedly absorbed them. At the same time, the production and marketing technologies for the fastest-growing products, such as fresh fruits and vegetables, have been introduced mostly by the private sector. In this context, it is crucial to revisit the role the private sector can play in generating knowledge and technology for agricultural development. What functions do farm input providers, farmers, processors, traders, and exporters have in agricultural innovation processes, and how can they become more directly involved in the financing, generation, diffusion, and adoption of new knowledge and technologies?

INNOVATION WHEN THE PRIVATE SECTOR GETS INVOLVED

Innovations in agriculture and food can be understood as new knowledge and technologies in agricultural and food production, processing, and marketing that are applied in economic and social processes. As a result of such innovations, farmers, processors, and traders become more competitive, produce or sell better-quality products, and generate greater profits. Innovation in agriculture relates to new and improved seed varieties, tissue, vaccines, equipment, and cropping and husbandry techniques. It also includes the application of quality protocols, organizational restructuring, improved management, and selling to new markets and buyers. Innovations can lead to improved management of natural and other resources and ultimately generate societywide benefits.

Because of insufficient access to capital and a misperception of the opportunities that arise from innovation, farmers and private-sector companies invest less in innovation than is optimal on the individual and social levels. As a result, governments and development agencies have supplemented private innovation efforts not only by providing funds, but also by establishing research capacity in public research organizations.

Has public investment in innovation services in Latin America hampered the willingness of the private sector to invest in agricultural innovation? Should the private sector be more involved in providing such services? Given limited public resources and insufficient research and innovation capacity in public organizations, how can the private sector play a more prominent role in agricultural innovation?

A survey by Pomareda in 2005 among Latin American agribusinesses revealed a number of basic conditions that encourage private firms to invest in innovation, including

- an understanding of the costs and benefits of innovating production, transformation, and marketing processes;
- demand for a product or service that results from the innovation;
- competition, which motivates the innovator to maintain or increase market share, establish barriers to entry, and displace competitors;
- favorable investment conditions, including access to investment capital, favorable interest rates, tax incentives, nonbureaucratic procedures, and political and legal stability; and
- an understanding of intellectual property rights laws and regulations and sufficient capacity to enforce them.

THE NATURE OF DEMAND FOR INNOVATION IN AGRICULTURE

Latin America is home to at least 15 million farms and more than 100,000 agricultural industries—small- to medium-size plants that process food and agricultural products or produce inputs. The region's production conditions span mountainous areas, valleys, and basins. In such a large and varied sector, the demands for technologies and new knowledge are extremely diverse.

In addition, some factors have changed agriculture in the region in recent years, leading to new demands for innovation. First, the production, transformation, and marketing of agricultural products are increasingly coordinated in supply or value chains—formalized supplier and buyer relationships that coordinate primary (or raw) production and farm input industries with processors, exporters, distribution centers, marketers, and consumers. Value chain arrangements exist at the local, national, and multinational levels. Chain coordination requires a highly fluid exchange of knowledge and technologies between the different actors. The needs of diverse actors in agricultural value chains are specific and usually cannot be met by generic research, but must be addressed in an interactive process between scientists, technology promoters and disseminators, and final users. Second, agricultural and food product markets have diversified and specialized over time. Changing consumer demands for convenience, quality, and food safety have led to a greater variety of basic food commodities, high-value products, and fresh and processed products. But consumer demand can be met only as long as knowledge and technology keep pace with product development efforts.

In Latin America, governments and public research organizations have for many years focused their efforts on traditional export and subsistence crops, including wheat, soy, sugarcane, coffee, beans, roots and tubers, beef, and wool. Some private initiatives have also focused on these commodities, particularly in the areas of seed production and tissue culture development. Nonetheless, according to recent data from the Food and Agriculture Organization of the United Nations (FAO), improved varieties of the 10 principal subsistence crops account for only 10 percent of total area sown in Latin America. The lion's share of cultivated area is sown with commercial crops.

The decline of many resource-poor farmers into subsistence farming and the polarization between small-scale farmers and commercial agriculture has led to policies in which the state takes responsibility for meeting the technological needs of poor farmers, while commercial

farmers rely on private (often their own) resources for their innovation needs. In consequence, smallholder farmers have often received knowledge and technology that anchor them in small-scale, resource-poor farming patterns, reducing their capacity to complement their incomes through commercial agriculture. Nevertheless, some countries have increased government support to the development of high-value, export production schemes, which creates conflicts of interest where national and international research centers continue to develop subsistence technologies. The issue is how to best mix government support to commercial and subsistence agriculture, both of which can and should be focused on achieving benefits for the poor.

In recent years, exports of more profitable and more capital- and technology-intensive products, such as flowers, fruits, asparagus, mini-vegetables, peppers, salmon, prawns, and broilers, have been possible because of technological developments sponsored by the private sector, mostly through foreign investment, but at times by visionary local entrepreneurs.

As products become increasingly diverse, identifying technological demands will likely become more complex. In any event, the tradition of setting research and innovation agendas on the basis of existing primary production is misguided. Rather, agendas should be determined by a combination of factors, including the needs of primary producers, processors, agribusiness, traders, and consumers.

Responses of Institutions and Markets

The responses to technological demands are diverse and come from different institutions and markets.

The public sector. Traditionally, governments in Latin America have given the responsibility for generating agricultural knowledge and technology to the national agricultural research institutes, or INIAs (the Spanish acronym). Over the years these institutes have produced valuable knowledge and technologies, particularly with regard to the adaptation of plant varieties. Because the INIAs' activities have been limited to conducting research, they have built alliances with organizations responsible for extension and technology transfer, but these linkages have not always worked well. The INIAs have gone through various cycles of government support and funding, causing them to grow and shrink. While some INIAs, especially in the Southern Cone and Mexico, have been strengthened by reforms, many others are still struggling with flaws in management, priority setting, human capacity, funding, bureaucracy, and relevancy. Although governments and donors still provide funds to INIAs, in recent years interest has been growing in alternative suppliers of

knowledge and technology. In Chile, Ecuador, and Peru, for example, competitive grant schemes were established in which not only INIAs, but also universities and other providers of scientific and technology-transfer systems could compete. Mexico and Nicaragua have largely privatized their extension services, and Bolivia has completely abolished its INIA and put agricultural research into the hands of four private regional foundations.

Universities. Universities in Latin America traditionally are teaching institutions with a college culture; few have engaged in true research and community service, and even fewer have become centers of excellence in agriculture. Reasons for this situation may include mismanagement, political polarization, corruption, unclear priorities, failure of reforms, and lack of funding. Nonetheless, some universities have tried to contribute to the development of the agricultural sector through basic research, whereas others have been involved in technology transfer to local communities. Still, Latin American universities lack the mandate to conduct development-oriented research, and the work of professors and departments is not coordinated with the needs of farmers and the agricultural sector. In conclusion, Latin American universities, a significant potential resource for agricultural innovation, have underutilized capacity for contributing to innovation in agriculture.

Producer organizations. Producer organizations and cooperatives have a long and often negative history in Latin America. Many have been subject to political abuse and flaws in management and administration and have often failed to serve the interests of their members, whether farmers, processors, or marketers. Those that have managed to become effective advocates for the interests of their members, however, are now part of a new generation of community- and commercial-oriented producer organizations that play an important role in producing and processing agricultural and food products. Examples include dairy cooperatives in Chile, Costa Rica, and Peru; fresh fruit producer organizations in Brazil; and horticulture and coffee producers in Colombia. Some organizations have set up their own research and technology-transfer facilities, such as the Colombian Coffee Institute of the Colombian Federation of Coffee Producers. Despite these success stories, in general the response of producer organizations to technological demands is slow and insufficient. Many continue to rely on subsidies from the state and invest little in technological innovation themselves.

Private knowledge and technology providers. Private suppliers of knowledge and technology, motivated by

profit, provide services to those producers, firms, and industries that require (and invest in) innovation and do not find appropriate or effective providers in the public or university sectors. Products provided by the private sector include seeds, vegetable tissue, semen and embryos, equipment, agrochemicals, and bio-fertilizers among others. Services include quality-control systems, laboratory analysis, export certification, and controlled-climate storage. A distinction can be made between private generators of innovations and private sellers of innovations created elsewhere. There is evidence that generators of innovations are limited to countries such as Brazil, Chile, and Mexico. In poorer countries like Ecuador, Guatemala, and Peru, private sellers of innovations are more prominent than generators of innovation, as shown by the successful development of cash crops and the development of the hybrid seed sector. In a way, the gap left by insufficient public and private provision of innovations has paved the way for the private sector to copy and import technology from abroad, including seeds, agrochemicals, and equipment.

Farmers and small processors. It is difficult to obtain information on how much farmers and processors invest in innovation because such statistics are not available, farmers and companies are reluctant to provide such information, or they do not know themselves. Small-scale farmers often rely on indigenous and local knowledge. At other times farmers and small processing companies copy from others, improve their businesses on a trial-and-error basis, or develop solutions without outside support. Such endogenous efforts to develop knowledge and technology appear to be sporadic and limited by a lack of entrepreneurial spirit. These initiatives often fail to garner a critical mass of innovation capacity and funding and consequently fall short of providing solutions that can compete in international environments.

Providers of agricultural inputs and agroindustry. Inputs in agricultural production and processing—whether seeds, fertilizers, pesticides, or machinery—are often provided by large national or multinational companies. To sell their products, these companies disseminate knowledge on the proper use of technologies and even create marketing campaigns promoting broader technology packages. For example, the zero-tillage package was promoted by the agrochemical company producing the herbicide that needs to be applied before planting the seeds. In the seed sector, most private initiatives focus on commercial hybrids, such as soybeans and maize, and not on seeds that are easily reproduced, like open-pollinated grains and potatoes. On the other hand, agribusiness companies that transform primary products into more convenient food products

are particularly interested in acquiring large quantities of consistently high-quality primary products. To this end, they inform producers about good agricultural practices and sometimes establish contract-farming relationships. Some agribusiness companies have set up their own R&D departments; others improve products and processes informally. The innovation potential of such companies is substantial.

PRIVATE SECTOR GENERATION OF KNOWLEDGE AND TECHNOLOGY

When private companies want to innovate, their options include setting up their own in-house R&D departments and hiring technicians and specialists, contracting with providers of knowledge and technology services, copying technology from others, and building alliances with providers of knowledge and technology services. To discover what private-sector actors in Latin America have done to innovate, Pomareda studied 20 cases in Argentina, Bolivia, Chile, Colombia, Costa Rica, and Peru.

The study found that many private initiatives were embodied in networks and partnerships between various actors, including agricultural companies and agribusinesses, cooperatives, nongovernmental research centers, universities (both national and foreign), government research entities, multinational technology companies, centers of the Consultative Group on International Agricultural Research (CGIAR), and government and donor agencies that provide financing through competitive funds. In other cases, private initiatives focused on importing knowledge and technology by contracting with international experts and consultants or by purchasing technologies from abroad, which usually came with technicians who provided knowledge on how to use and maintain the new equipment. Sometimes a company internalized new knowledge simply by hiring a specialist from abroad who already had the knowledge. Although such arrangements to absorb new knowledge are often underreported relative to the successes of public research projects, in many cases they have revolutionized entire agricultural sectors.

Private companies prefer to enter into partnerships or network arrangements when there is agreement on a common objective—often one designed to improve the competitiveness of the partners and whole agricultural value chains—and a willingness to share costs, risks, and benefits. Partnerships between technology providers and

the productive sector is a promising way to pool scarce human and financial resources for innovation and collectively develop solutions that respond to the needs of farmers, consumers, and agroindustry. Such partnerships are most likely in environments where individualism is strong and collective action is weak, and where there is limited capability to identify problems and find solutions. Some of the more successful partnerships studied involved the diagnosis of pests that affect quality of products, development of protocols for processed fruits and vegetables, and genetic adaptation of cereal varieties to local conditions. Critical factors in the success of such partnerships included

- the existence of economies of scale (most research can produce satisfactory results only if a critical mass of resources and capacity are brought together);
- the severity of the problem (the problem makes partners noncompetitive);
- technical and operational capability (partners demonstrate that they have sufficiently capable human resources with adequate organizational and management skills);
- clarity of functions (the partnership is well planned, and all partners agree on their roles, contributions, and rights);
- commitment (partners are committed to the partnership and willingly make their expected contributions);
- clarity on costs and benefits (partners have a clear understanding of the potential costs and benefits);
- sufficient resources (financial resources are available to enable R&D and the production and commercialization of products and services);
- involvement of facilitators (facilitators play a fundamental role in bringing partners together, analyzing potential benefits, setting objectives, and planning activities); and
- the existence of leadership (the partnership needs a leader who can motivate all partners and resolve conflicts).

In many cases, however, agribusinesses and agricultural companies reject partnerships, preferring to address innovation requirements in primary production internally by, for example, developing their own R&D skills and becoming involved in primary production directly or in association with producers. Other companies opt out of partnerships because they do not want to share technological solutions with competitors. Companies are also sometimes reluctant to enter into relationships with providers of knowledge and technologies because they do not expect them to generate rapid results.

CONCLUSION

Government and donor efforts in Latin America have been insufficient to develop knowledge and technologies for products that increase the income of the poor. They have also been insufficient to foster agricultural innovation among local input providers, producers (small- to medium-scale farmers), and processing companies. As a result, the productive sector has looked for alternatives, including initiating innovative solutions on its own, copying and buying solutions from abroad, and, in particular, partnering with appropriate providers.

Numerous opportunities exist for developing knowledge and technologies that can improve agricultural products, add value, and generate income for local primary producers, processors, and other actors. To identify what innovation is really required, knowledge providers need to take into account the complementary and sometimes competing demands of primary production, processing, agribusiness, and consumers. Suppliers of innovation include not only research organizations, universities, and extension agencies, but also consultants, agroindustry, and farmers and processors themselves. More flexible government funding schemes and more open structures for partnerships between scientists, private knowledge providers, and private users of knowledge will help involve these actors more prominently in the innovation process.

Governments and donors that aim at fostering agricultural innovation may bear in mind that focusing only on public goods and small-scale farming technologies will not bring together enough actors and will not meet the existing demands for innovation. To energize poverty alleviation efforts in developing countries' agriculture, pro-poor technologies need to be complemented with an enhanced focus on the demands of private, small-scale producers.

Measures toward this end include

- engaging them in generating and expanding technological innovations initiated by public institutions and the commercial sector;
- disseminating and promoting information on providers and clients of knowledge and technology services;
- strengthening competitive grants programs that provide private-sector agencies with access to technological goods and services and foster strategic alliances among users and providers of technologies;
- ceasing government "give-away" programs for technological goods and services that distort competition and discourage small entrepreneurs from investing in innovation;
- promoting opportunities to invest in innovation in the country's agriculture;
- helping producers and their organizations to identify their "real demand" for technological goods and services as part of a business development and management support program; and
- reorienting the role of the national agricultural research organizations away from the exclusive generation of public goods (such as seeds for small-scale farmers) toward the production of appropriate technologies and knowledge that provide innovators with an innovation rent and thus foster innovation—which is a public good in itself.

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ABOUT THE AUTHORS

Carlos Pomareda (sidesa@racsa.co.cr) is director of Servicios Internacionales para el Desarrollo Empresarial S.A., in San José, Costa Rica, and **Frank Hartwich** (f.hartwich@cgiar.org) is a research fellow in the ISNAR Division of IFPRI in San José, Costa Rica.

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INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

2033 K Street, NW, Washington, DC 20006-1002 USA

T. +1.202.862.5600 • F. +1.202.467.4439 • ifpri@cgiar.org

www.ifpri.org



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